TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED / ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: P67679US0

APPLICATION NO (if known, see 37 CFR 1.5): 10/069528

INTERNATIONAL APPLICATION NO	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/CN99/00141	7 September 1999	7 September 1999

TITLE OF INVENTION: **APPARATUS FOR MANUFACTURING BIODEGRADABLE PLANT FIBRE PRODUCTS**

APPLICANT(S) FOR DO/EO/US: **Wei ZHANG**

Applicant herein submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for Internatl. Preliminary Examination was made by the 19th month from earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the Internatl. Preliminary Examination report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:
    International Search Report
    First Page of Publication
    Demand

US APPLICATION NO (If known, see 37 CFR 1.5) 10/069528	INTERNATIONAL APPLICATION NO PCT/CN99/00141	ATTORNEY'S DOCKET NUMBER P67679US0

	CALCULATIONS	PTO USE ONLY
17. ☒ The following fees are submitted:		
Basic National Fee (37 CFR 1.492(a)(1)-(5)):		
Internatl. prelim. examination fee paid to USPTO (37 CFR 1.492 (a) (1)) . . $710.00		
No international preliminary examination fee paid to USPTO (37 CFR 1.492 (a) (2)) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) . . $740.00		
Neither international preliminary examination fee (37 CFR 1.492 (a) (3)) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO) **$1040.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.492 (a) (4)) and all claims satisfied provisions of PCT Article 33(2)-(4) $100.00		
Search Report prepared by the EPO or JPO (37 CFR 1.492 (a) (5)) **$890.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 1040.00	
Surcharge of $130.00 for furnishing the **oath or declaration** later than ☐ **20** ☒ **30** months from the earliest claimed priority date (37 CFR 1.492(e)).	$ 130.00	

Claims	**Number Filed**	**Number Extra**	Rate		
Total Claims	**9** - 20 =	-0-	x $18.00	$	
Independent Claims	**1** - 3 =	-0-	x $84.00	$	
Multiple Dependent Claim(s) (if applicable)			+ $280.00	$	
TOTAL OF ABOVE CALCULATIONS =				$ 1170.00	
Reduction by 1/2 for filing by **small entity**, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).				$	
SUBTOTAL =				$ 1170.00	
Processing fee of $130 for furnishing the **English translation** later than ☐ **20** ☐ **30** months from the earliest claimed priority date (37 CFR 1.492(f))				$	
TOTAL NATIONAL FEE =				$ 1170.00	
Fee of $40.00 for recording the enclosed **assignment** (37 CFR 1.21(h)). Assignment must be accompanied by appropriate cover sheet (37 CFR 3.28, 3.31).				$	
TOTAL FEES ENCLOSED =				$ 1170.00	
				Amt. to be refunded:	$
				Amt. charged:	$

a. ☒ A check in the amount of $ 1170.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. **06-1358** in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge my account any additional fees set forth in §1.492 during the pendency of this application, or credit any overpayment to Deposit Account No. **06-1358**. A duplicate copy of this sheet is enclosed.

SEND ALL CORRESPONDENCE TO:

JACOBSON HOLMAN PLLC
400 7th Street, N.W., Suite 600
Washington, DC 20004
202-638-6666
CUSTOMER NUMBER: 00136

By _____
John C. Holman
Reg. No. 22,769

JPH&S 3/95

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Wei ZHANG

Serial No.: New

Filing Date: March 6, 2002

For: APPARATUS FOR MANUFACTURING BIODEGRADABLE PLANT FIBRE PRODUCTS

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to initial examination, please amend the above-identified application as follows:

IN THE SPECIFICATION

On page 1, immediately following the title, please insert the following sentence: --This is a nationalization of PCT/CN99/00141 filed September 7, 1999 and published in English.--

IN THE CLAIMS

Please amend claim 5 as follows:

5. (amended) A molding apparatus as claimed in claim 3 wherein said heating means comprise electrical heating coils within said mold portions.

REMARKS

The foregoing Preliminary Amendment is requested in order to delete the multiple dependent claims and avoid paying the multiple dependent claims fee.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE.**"

Early action on the merits is respectfully requested.

Respectfully submitted,

JACOBSON HOLMAN PLLC

By _____

John C. Holman
Reg. No. 22,769

400 Seventh Street, N.W.
Washington, D.C. 20004-2201
(202) 638-6666

Atty. Docket: P67679US0
Date: March 6, 2002
JCH/cmf

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS

5. (amended) A molding apparatus as claimed in claim 3 [or claim 4] wherein said heating means comprise electrical heating coils within said mold portions.

APPARATUS FOR MANUFACTURING BIODEGRADABLE PLANT FIBRE PRODUCTS

FIELD OF THE INVENTION

This invention relates to a molding apparatus and, in particular, although not necessarily solely, an apparatus for the molding of biodegradable fibre foam materials.

BACKGROUND TO THE INVENTION

For sometime, the fast food industry has been using a variety of packages or materials for containing the food served in an outlet. However, these packages are not all biodegradable and can cause problems to the environment.

Improved materials for the manufacture of such packaging have been developed including foam materials made from biodegradable fibres. However, although the material has been developed, apparatus for the automatic production of packages using this type of material has not been readily developed.

Conventional forms of plastic moldings such as rotational or injection molding are unsuitable for this type of material. The material requires curing at elevated temperatures and pressures for a pre-determined period of time and is not suitable for passage through the injectors of an injection molding machine.

As a result, such materials have been formed into packages using relatively simplistic means. These involve simple manually operated dies or molds utilizing a lever to press opposed mold portions together. To produce packaging for the fast food industry or other industries where such biodegradable packaging may be desirable

requires an apparatus capable of automatic control and production to increase efficiency.

Additionally, the manual nature of the previous apparatus has led to a variety in the quality of product produced with an operator being unable to ensure an even temperature, pressure and time operation.

OBJECT OF THE INVENTION

It is an object of the present invention to provide an automatic apparatus for the production of fibre foam items that will overcome some of the problems and disadvantages of the prior art to provide more efficient production and/or higher quality product or at least provide the public with a useful choice.

SUMMARY OF THE INVENTION

The present invention may broadly be said to consist in a molding apparatus comprising:

- a first mold support means having a plurality of individual mold portions on one side thereof;
- a second mold support means having a plurality of mold portions on one side thereof. said sides of said first and second mold support means on which said mold portions are mounted opposing each other and said mold portions being arranged on said mold support means to form a plurality of cooperating pairs of mold portions to form a plurality of mold cavities therebetween:

- a rotational mounting and drive means to allow simultaneous rotation of said first and second mold support means about a common axis;
- means to open and close said pairs of mold portions independently at discreet intervals throughout the rotation of the mold support means;
- at least one product ejecting means positioned adjacent said mold support means to eject finished product from said mold cavities when a pair of said molding portions are open;
- at least one material feeder adjacent said mold support means to introduce material to said mold portions after a previous product has been ejected and also while said pair of mold portions are open; and
- control means to control at least the temperature of said mold portions.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention will now be described with reference to the following drawings in which:

- Fig. 1 shows an elevational view of one embodiment of a molding apparatus in accordance with this invention:
- Fig. 2 is a schematic view of the surface of one of the mold support means to show the arrangement of the molding portions;
- Fig. 3 is a further plan view of the mold support means showing the arrangement of the associated apparatus;
- Fig. 4 is a diagrammatic chart detailing the timing sequence of the operations:
- Fig. 5 is a cross-sectional elevation through a material feeding unit forming part of the apparatus of Fig. 1,

- Fig. 6 is a plan view of the apparatus of Fig. 5;
- Fig. 7 is a cross-sectional elevation through a pair of molding portions of the preferred embodiment; and
- Fig. 8 is a further cross-sectional elevation of the apparatus of Fig. 7 in an open condition.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

This invention relates to a molding machine to mold products generally from a fibre material. Such products may be used as utensils such as dishes for the fast food industry or various kinds of packaging.

Aspects of this apparatus may well be applied to molding machines for other materials although the preferred embodiment described is generally in relation to the production of products from such a fibre foam material.

Referring to Fig. 1, the apparatus comprises a machine 1 having a first mold support means 2 on which may be positioned a plurality of molding portions 3. The molding portions 3 are positioned on a first side 6 of the mold support means 2.

Opposing this first mold support means 2 is a second mold support means 4. The second mold support means 4 is separated from the first mold support means 2 and carries a plurality of molding portions 5. Again, these molding portions 5 are arranged on a face 7 of the second mold support means 4 and are arranged such that they oppose and cooperate with the molding portions 3 on the first mold support means 2.

With such an arrangement, the molding portions 3 and 5 on the opposed mold support means 2 and 4 cooperate to form pairs of molding portions creating an individual mold cavity between each pair.

Means for opening and closing the cooperating pairs of molding portions 3 and 5 are provided for each pair of molding portions. As shown in this preferred embodiment, the upper molding portion 5 is driven by an arm 8 which itself may be powered by a hydraulic cylinder or similar 10. This hydraulic cylinder 10 can both regulate the pressure of the molding operation and also close the mold when required.

The upper mold portion 5 is capable of assuming an open condition as shown in position 9 on Fig. 1 in which arm 8 connected to this upper portion 5 has retracted into the second mold support means 4. The retraction of this can be performed hydraulically, mechanically or by such other means as may be desired.

It should be noted that in general, this preferred embodiment arranges the first and second mold support means 2 and 4 as a lower and upper mold support means respectively. The reference to upper and lower throughout the description is provided in relation to this particular embodiment although it is the relative arrangement rather than the spacial configuration which is important. In general. it has been found that the provision of an upper and lower mold support means and operation of the molds intermediate of the support means may provide an easier configuration of the associated apparatus arranged around the mold support means.

The first and second mold support means 2 and 4 are both concentrically mounted about a generally central axis 11. Drive means 12 are provided in the form of a motor or similar which acts through a transmission including a main gear 13 or similar to drive the simultaneous rotation of both the first and second mold support means. The simultaneous rotation is required to avoid any relative movement in the horizontal direction between the lower and upper mold portions 3 and 5 with each pair of mold portions 3 and 5 moving together on the installation positions about the axis 11.

The form of drive to create the rotation and the manner in which a transmission is provided to drive the mold support means 2 and 4 can comprise any variety of mechanisms to achieve this purpose.

By rotating the mold support means 2 and 4, other apparatus can be arranged adjacent the rotational path of the pairs of molding portions 3 and 5.

This other apparatus arranged adjacent the rotational path of the molding portions may include means 14 to eject the product and a material feeding or loading apparatus 15 to refill the mold cavity with material for a subsequent molding operation.

This preferred embodiment utilizes the rotation of the mold support means 2 and 4 to time the molding operation. Each pair of molding portions 3 and 5 is in an open condition at a specific interval during the rotation to allow the previous product to be ejected and further material to be introduced to the mold. Throughout the

remainder of the rotation, the mold is closed under controlled temperature and pressure conditions to create the molded product itself.

This preferred embodiment utilizes a single product ejecting means 14 and material feeding apparatus 15 around the rotational path of the molding portions 3 and 5. Of course, alternative embodiments could provide two or more sets of these additional portions of apparatus at discreet intervals around the mold support means 2 and 4. the molding operation being completed in, for example, a 180 degree rotation of the mold support means 2 and 4 rather than the full molding operation taking place over a 360 degree rotation of the mold support means 2 and 4 as shown in this embodiment.

The arrangement of the mold portions 3 and 5 in this preferred embodiment is such that they are substantially concentrically arranged around the central axis 11. This minimizes any need for adjustment or movement of the associated apparatus such as the product ejecting means 14 and material feeder 15. However, in other embodiments, the cooperating pairs of molding portions 3 and 5 may be in a staggered formation on the mold support means 2 and 4 or align in inner and outer concentric circles on the opposed faces 6 and 7 of the mold support means 2 and 4.

Referring to Fig. 2, a plan view of the first mold support means 2 of the preferred embodiment is shown. It can be seen that the mold portions 3 are arranged in a single concentric circle towards the outer edge 16 of the support means 2. To provide simpler positioning of the apparatus around the support means 2, the support means 2 is preferably provided with a generally circular outer circumference and each

of the mold portions are positioned equal distant from that outer edge and, also preferably, at an equal radial angle "X" from each other. The distinction of mold portion 5 on support means 4 is similar.

Referring to Fig. 3, the support means 2 is shown with the material feeding apparatus 15 adjacent the rotatable support means 2. A controller 26 is provided to have overall control over the operations of the unit.

With the material feeding unit and other apparatus positioned adjacent the rotatable support means 2 and 4, rotation of those support means may be either continuous or intermittent.

If continuous, the associated apparatus needs to operate with the molding portions moving pass the apparatus. For example, in the case of the material feeder 15, this must be able to deliver the material while the mold continues to pass the apparatus and needs to be timed to deliver the material while sufficient of the mold is adjacent to the apparatus 15 to accept the material. Alternatively, some motion of the material feeding unit 15 with the turntable over at least a distance sufficient to deliver the material is necessary.

An alternative operation is provided if the mold support means 2 and 4 are moved intermittently to bring each mold adjacent the associated apparatus such as the material feeding unit 15 and then remain stationary while the operation is carried out. The drive can then be re-engaged by the control means to rotate the table to position another mold adjacent the apparatus 15 and other such apparatus. All this control

over the drive may be provided by a controller 26 activating, deactivating or regulating the speed of the drive as required.

The material feeding apparatus 15 is shown in more detail in Figs. 5 and 6.

Referring to these figures, the material feeding apparatus 15 can be seen to comprise an initial funnel or hopper 38 to receive the material in bulk. A screw conveyor 37 is driven by a motor 39 to deliver the material to a rotating table 36. This rotating table 36 acts to convey the material from the screw conveyor 37 to the molds themselves. As shown in Fig. 1. the table 36 rotates to pass over the cavity of molds 3.

The rotating table 36 contains cylinders 42 which receive a portion of the material 41 from the screw conveyor 37. The material 41 is forced into the cylinder 42 and the quantity is controlled by a piston 32 moving within the cylinder 42. An adjustable stop 34 is provided which contacts a rearward element of the piston 32 to limit the travel of the piston 32. In this preferred form, the stop 34 is provided in the form of a screw thread having an angled face 43 which meets and co-operates with similarly angled face 44 at the rear of the piston 32. As the faces meet an at angle intermediate of the direction of the screw thread 34 and the piston travel, the stop position of the piston 32 can be adjusted by the rotation and resultant penetration of the stop means 34 into the cylinder 42.

A further stop means 33 is provided to limit the outward travel of the piston 32.

As shown in the plan view in Fig. 6, a plurality of the cylinders 42 may be provided around the circumference of the table 36 which rotates about a central axis 35. In operation, the material 41 is fed into the end of the cylinders 42 and the quantity is controlled by the rearward travel of the piston 32.

As the table rotates, the cylinders 42 will pass over molds rotating beneath an opposed side of the table 36 as shown in Fig. 1. At that time, a fluid may be introduced to the cylinders 42 through an inlet 40 rearward of the piston 32. This fluid may be a compressible gas or hydraulic fluid as desired. In this preferred form, compressed air is introduced to the cylinder 42.

The introduction of the fluid forces the piston 32 to its outward position and delivers the material 41 into the mold passing beneath.

As shown in Fig. 6, the table 36 rotates in the direction of the arrow 45 being an opposed direction to the rotation of the mold support means 2 and 4. Such rotation ensures that the cylinders 42 are provided with additional time passing over the molds beneath as the molds and the cylinders 42 travel over intersecting arcuate paths.

The intersection of the arcuate paths of the molds and the cylinders 42 are such that the mold support means 2 and 4 can continue their rotation during the delivery of the material rather than utilizing an intermittent rotation of the mold support means. The timing of the delivery of the material can be controlled through the timing of the introduction of the compressed gas through the inlet 40 and can be

microprocessor controlled or position sensor controlled or mechanically timed as desired.

Referring to Figs. 7 and 8, the molding portions 3 and 5 can be seen in greater detail.

Referring firstly to Fig. 7, it can be seen that the apparatus includes temperature control mechanisms in each of the molds such that the molds may operate at elevated temperatures. In this Fig. 7, the upper and lower mold portions 5 and 3 respectively are shown in a closed condition to form a mold cavity 50 between them.

Heating means 58 and 59 are provided to the upper and lower molds 5 and 3 respectively. It should be noted that the purpose is to elevate the temperature of the molding operation and this preferred form provides this with heaters in both the upper and lower molds. However, in alternative embodiments, it may be possible to utilize a single heater.

This preferred embodiment uses electrically powered heating coils for the heating means 58 and 59 which are disbursed evenly around the molding surfaces.

The heating of the mold may be controlled by the placement of suitable sensors 56 placed in the molds adjacent the mold surface. Alternatively, the sensors may be placed elsewhere on the mold to obtain a general indication of the molding temperature. The sensors 56 may be provided singularly or in plural and merely need to be thermally connected to the mold cavity.

The apparatus in Fig. 7 shows the upper and lower molds 5 and 3 in a closed condition. In this instance, the rod 8 attached to the upper mold is at a depressed state to close the mold. The upper mold has a mold seat 51 and above this there is provided a cooling system which, in this instance, comprises a fluid jacket 60. The lower mold 3 similarly has a fluid jacket 63 to allow the passage of coolant around the molds but away from the molding surface itself. This cooling system is provided in the preferred example so that the remainder of the apparatus is thermally insulated from the elevated temperatures created in the mold cavity 50. This avoids the need for other mechanical, electrical or similar components to be thermally protected.

Each of the coolant jackets 60 and 63 have inlets 61 and 64 respectively for the entry of coolant and outlets 62 and 65 respectively for the outlet of the coolant. The flow of coolant around the jackets 60 and 63 allows excess heat from the molds to be drawn away for dispersion before the coolant is returned for another pass through the jackets 60 and 63.

The coolant system can be provided by alternative means such as layers of thermal insulation although this does not allow the dispersion of the excess heat should it be created. The cooling fluid can be any suitable thermally conductive liquid or gas.

This preferred embodiment provides information from suitable temperature sensors 56 to the overall control mechanism 26 which itself controls the operation of the heaters 58 and 59. The operation can comprise the switching on and off of the

heaters as required or a modulated control of the output of the heaters if this is preferred.

Turning to Fig. 8, the upper and lower molds 5 and 3 respectively are shown diagrammatically to demonstrate part of the product ejection mechanism 14.

In this figure, the upper mold 5 shown withdrawn from the lower mold 3. As the upper mold 5 is withdrawn, a push ring 71 biased by spring 74 operates to assist in the release of the product 76 from the surface of the upper mold 5. The push ring 71 is shown in cross section in Fig. 7 and can be seen to act on an upper edge of the product 76.

As the upper mold support 51 raises, the biasing means 74 in the form of a compression spring and its associated connecting bolt 73 drive the push ring 71 down over the surface of the upper mold 5. Only a short movement of the push ring 71 is needed to break the seal the product 76 has made against the upper mold 5.

The product 76 may be raised from the lower mold 3 through the use of a push rod 72 operating through the bottom of the mold 3.

It will be appreciated that once the upper mold 5 has fully retracted, the push rod 72 can raise the product 76 clear of the lower mold 3 and the product 76 can be ejected transverse to the direction of travel of the push rod 72 by the ejection rod 78 shown in Fig. 1.

Aside from the ejection mechanism 14 and the material feeding unit 15, other apparatus may be provided to operate while the mold is in an open condition. Specifically, the apparatus may include a cleaning step to remove debris from the molds prior to the entry of further material to form another product. In this preferred embodiment, the apparatus includes a nozzle for the outlet of compressed gas to blow debris from the mold. Other means could be utilized if desired.

Another intermediate step taken between the ejection of the product and the placement of new material may be the introduction of a lubricant or releasing agent into the mold. This can assist in the release of the product from the mold surfaces and again may be provided by a nozzle providing a spray of lubricant or releasing agent onto one or both of the upper and lower mold surfaces.

The controller 26 can control rotation of the upper and lower mold support means 2 and 4, the timing of the material feeding unit 15, the temperature of the molds and other operations as required. The sequence of events and the timing of events for this preferred embodiment is shown in Fig. 4.

Fig. 4 demonstrates a relative timing of operations. This details the operations generally over the period in which the mold is open with the line 81 showing the mold opening over the first two time units and closing over the last two time units and remaining in its fully open condition for the intermediate six time units.

The upper push ring operates slightly after the mold commences to open and once fully open, need only the bias into the open condition for a short time. This is shown by line 82 in Fig. 4.

The operation of the lower push rod is demonstrated by line 83 and operates slightly after the upper push ring commences its push up movement to allow the product to be pushed away from the cavity of mold 3 by push rod 72.

Line 84 shows the period of operation of the product push arm 78 to eject the product from the top of the lower push rod. This is timed to commence after the lower push rod has reached its extended position and finishes prior to the lower push rod lowering for a subsequent operation.

Line 85 shows the operation of the cleaning and spraying of lubricant or releasing agents into the molds. It is only following this step that material is reintroduced to the mold over the time period as shown by line 86. Once the material has been introduced to the mold. the mold can commence closing.

In operation. this preferred embodiment introduces material to the molds at which time the molds close and rotate in excess of 270 degrees around the central axis 11. The time taken for this rotation and the speed of rotation is determined by the time required for the molding operation.

As the mold approaches the completion of a cycle, the mold opens for the ejection of the product, the cleaning of the molds and introduction of the releasing agent before further material is introduced.

It can be seen that each pair of upper and lower molds 5 and 3 may undergo this cycle independently to provide a substantially continuous production of products from the apparatus.

Although this invention has been described with reference to a particular preferred embodiment, it will be appreciated that many of the steps or items of apparatus may be substituted for known equivalents or omitted if not essential to the operation. The invention should not be considered limited by the description which is provided by way of example but instead is defined by the appended claims.

CLAIMS

1. A molding apparatus comprising:

- a first mold support means having a plurality of individual mold portions on one side thereof;
- a second mold support means having a plurality of mold portions on one side thereof, said sides of said first and second mold support means on which said mold portions are mounted opposing each other and said mold portions being arranged on said mold support means to form a plurality of cooperating pairs of mold portions to form a plurality of mold cavities therebetween;
- a rotational mounting and drive means to allow simultaneous rotation of said first and second mold support means about a common axis;
- means to open and close said pairs of mold portions independently at discreet intervals throughout the rotation of the mold support means;
- at least one product ejecting means positioned adjacent said mold support means to eject finished product from said mold cavities when a pair of said molding portions are open;
- at least one material feeder adjacent said mold support means to introduce material to said mold portions after a previous product has been ejected and also while said pair of mold portions are open; and
- control means to control at least the temperature of said mold portions

2. A molding apparatus as claimed in claim 1 wherein said first and second mold support means are provided as lower and upper mold support means rotating in a substantially horizontal plane.

3. A molding apparatus as claimed in claim 1 wherein at least one of each pair of mold portions is provided with heating means to heat the product being molded.

4. A molding apparatus as claimed in claim 3 wherein both of said mold portions are provided with heating means.

5. A molding apparatus as claimed in claim 3 or claim 4 wherein said heating means comprise electrical heating coils within said mold portions.

6. A molding apparatus as claimed in claim 1 wherein a cooling means is provided to thermally insulate said mold portions from a remainder of said apparatus.

7. A molding apparatus as claimed in claim 1 wherein said at least one material feeder includes a rotating delivery portion rotating in a parallel plane to said first mold support means and in an opposed direction around an axis such that mold portions on said first mold support means intersect and pass beneath an arcuate path of said rotating delivery portion.

8. A molding apparatus as claimed in claim 1 further comprising cleaning apparatus to remove debris from at least one of said cooperating pair of mold portions after ejection of a product and prior to introduction of material for the production of a further product.

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9. A molding apparatus as claimed in claim 1 further including means to deliver a lubricant or releasing agent onto at least one of each cooperating pair of mold portions.

Abstract

This invention provides a molding apparatus for the molding of foamed fibre products. A plurality of upper and lower molds are provided on simultaneously rotating supports such that each co-operating pair of molds is open during a specific portion of the cycle of rotation. While open, a previous product is ejected, the molds may be cleaned and releasing agent introduced and further material introduced to the mold for a subsequent molding operation. The mold then closes and continues rotation.

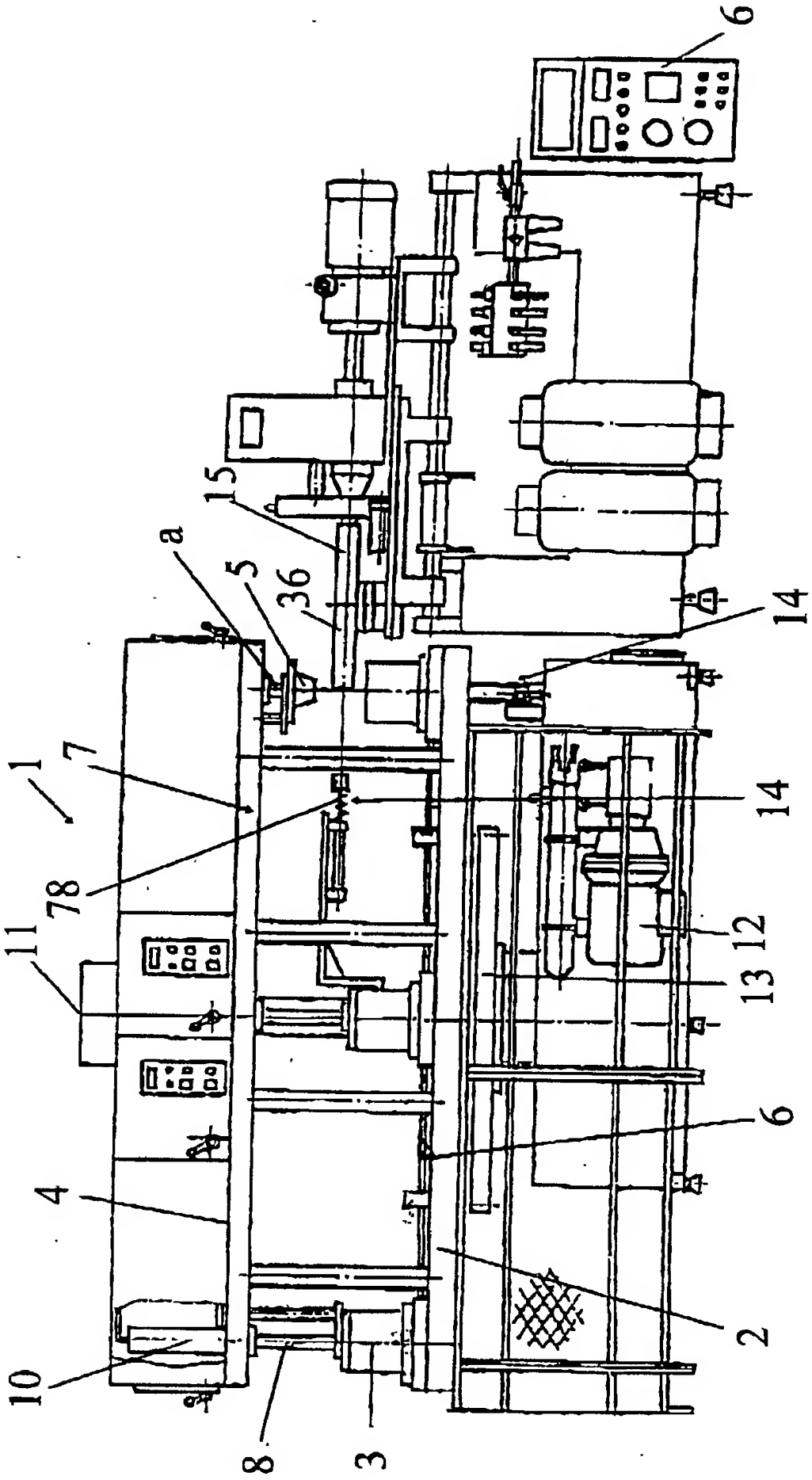

FIG. 1

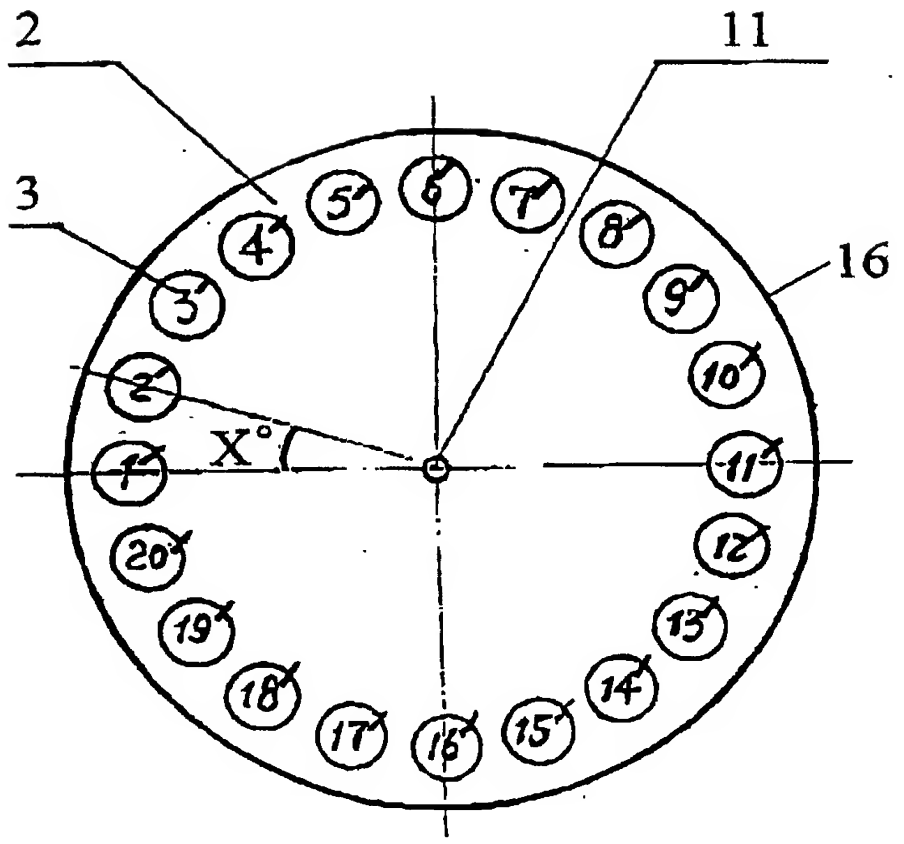

FIG. 2

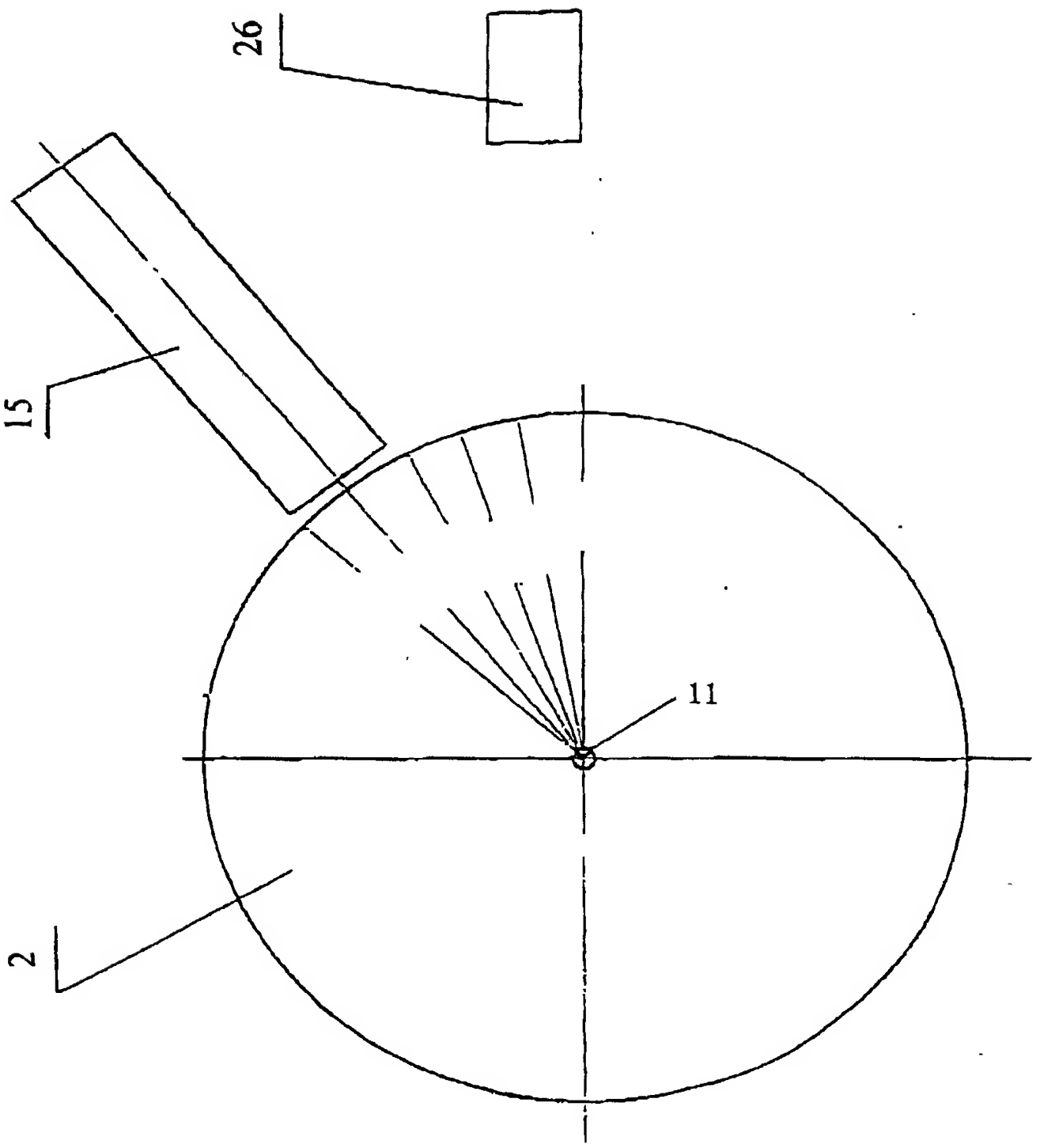

FIG. 3

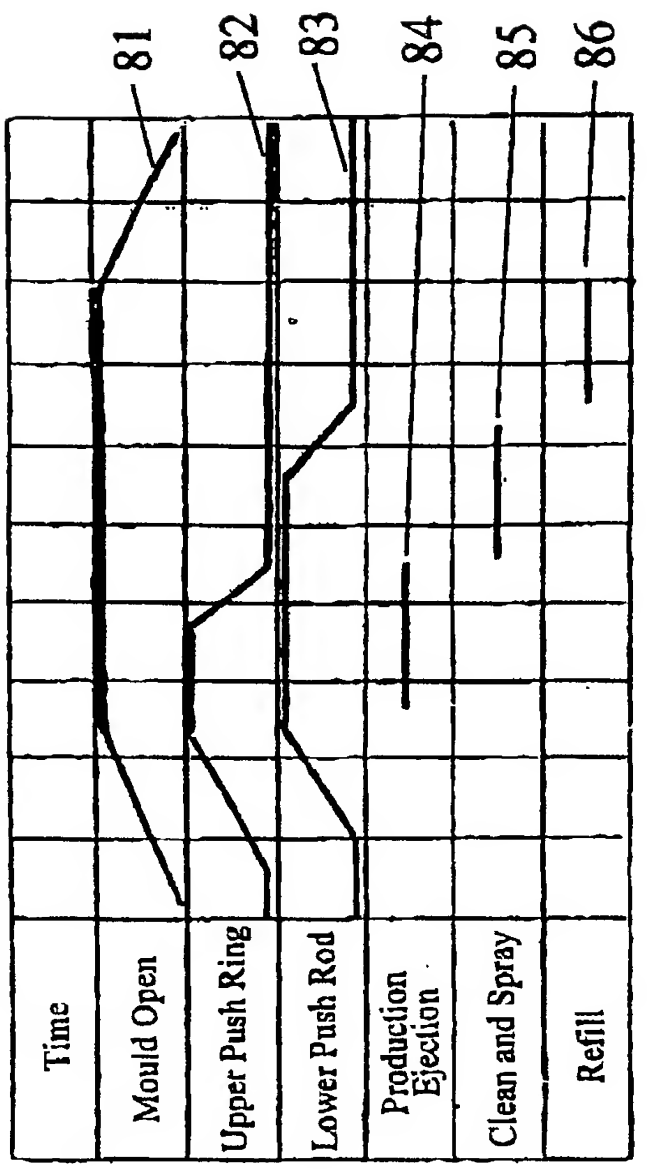
81
82
83
84
85
86
0 1 2 3 4 5 6 7 8 9 10
Time
Mould Open
Upper Push Ring
Lower Push Rod
Production Ejection
Clean and Spray
Refill

FIG. 4

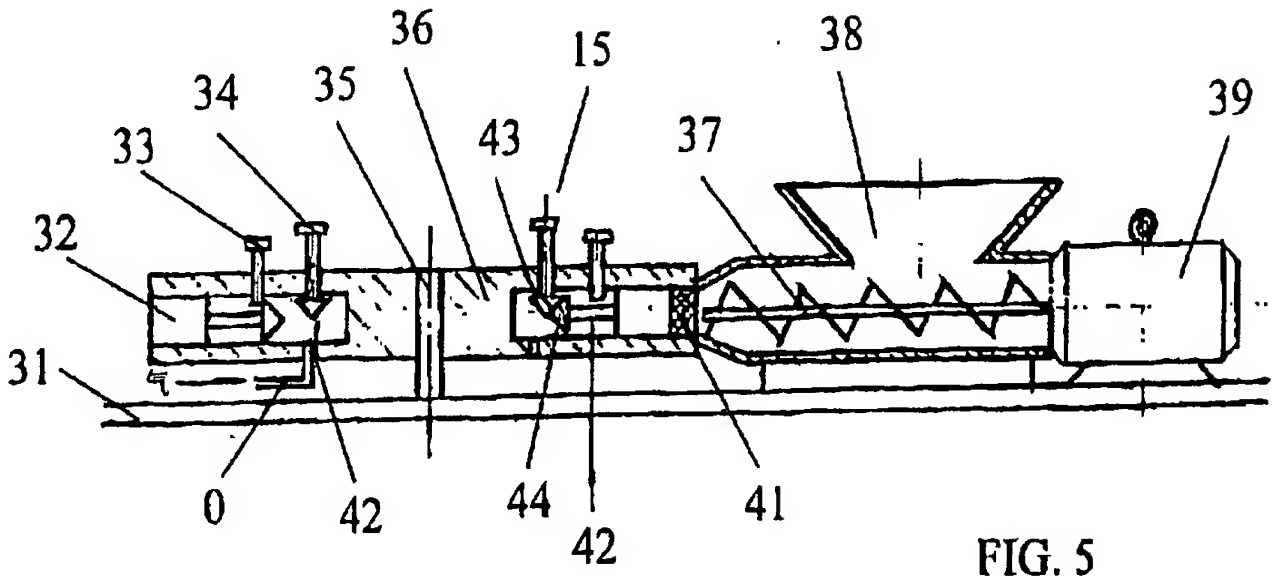

FIG. 5

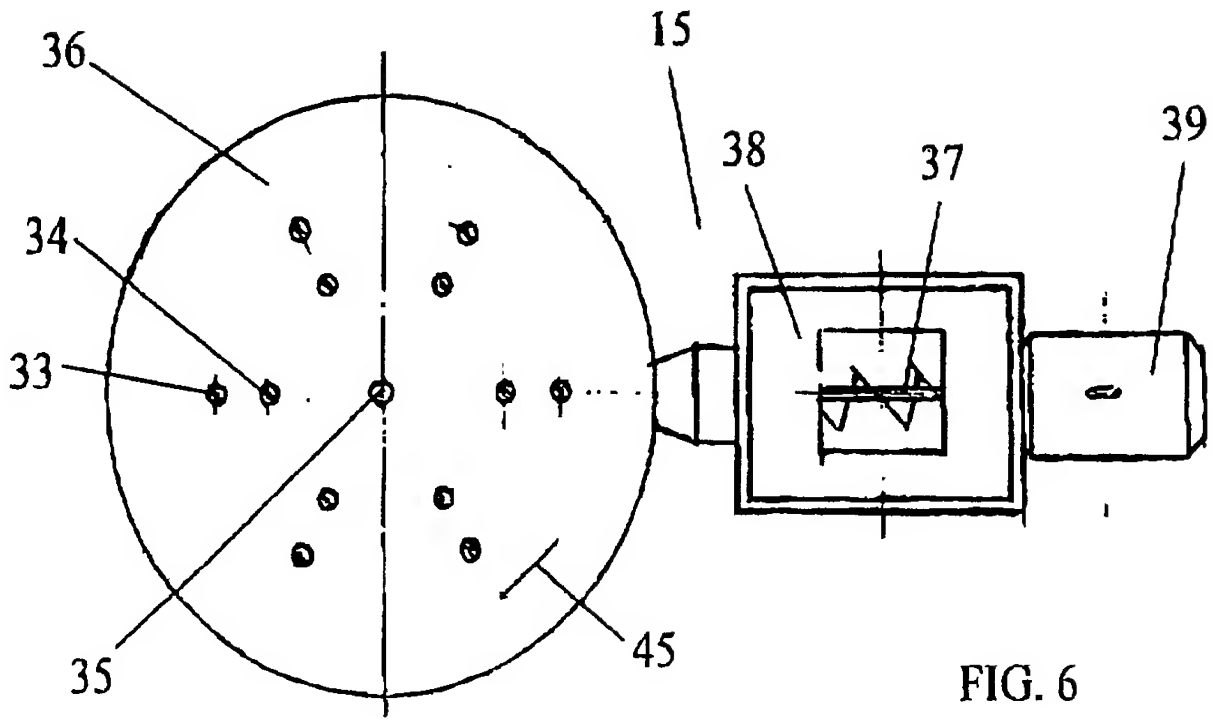

FIG. 6

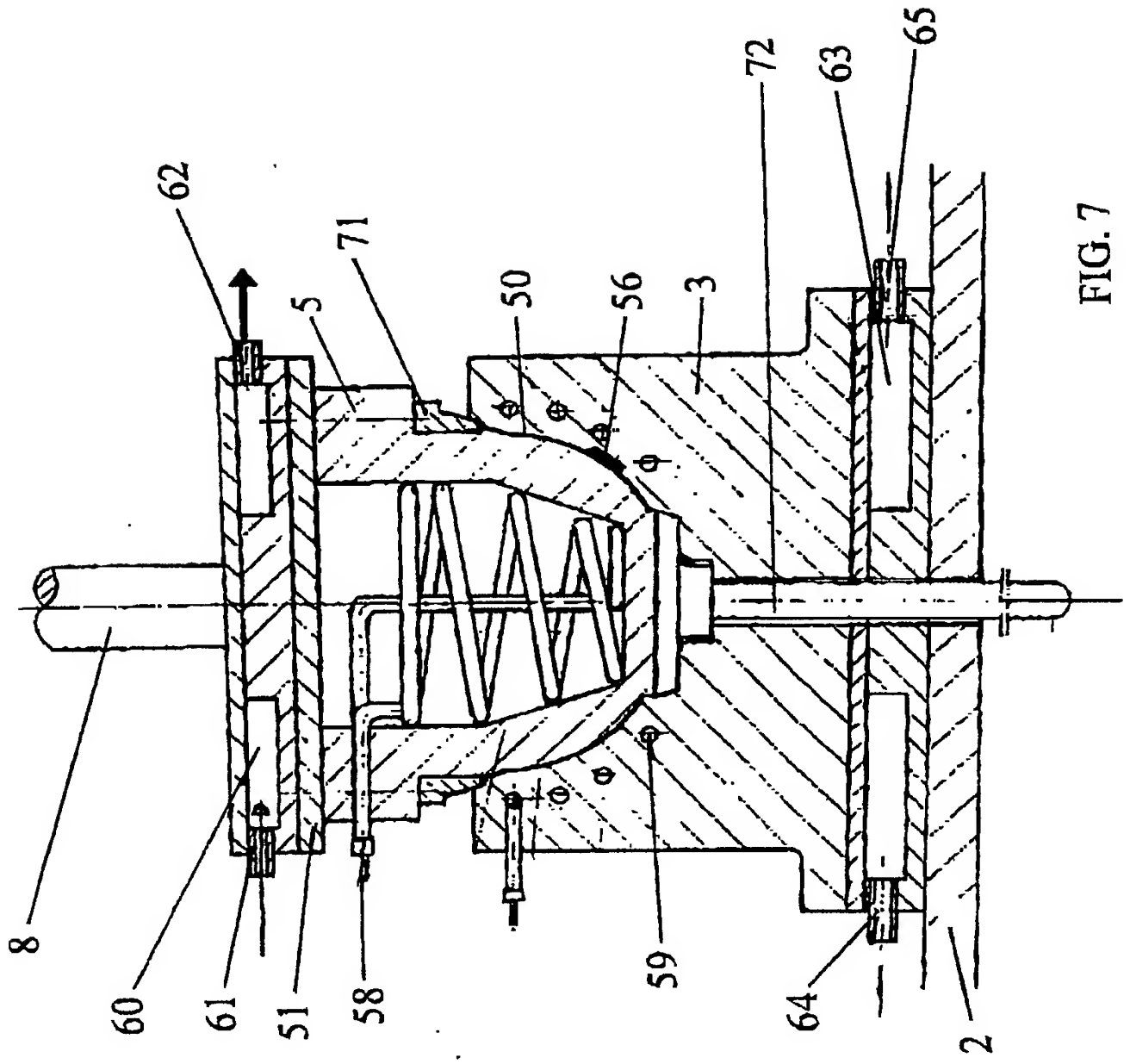

FIG. 7

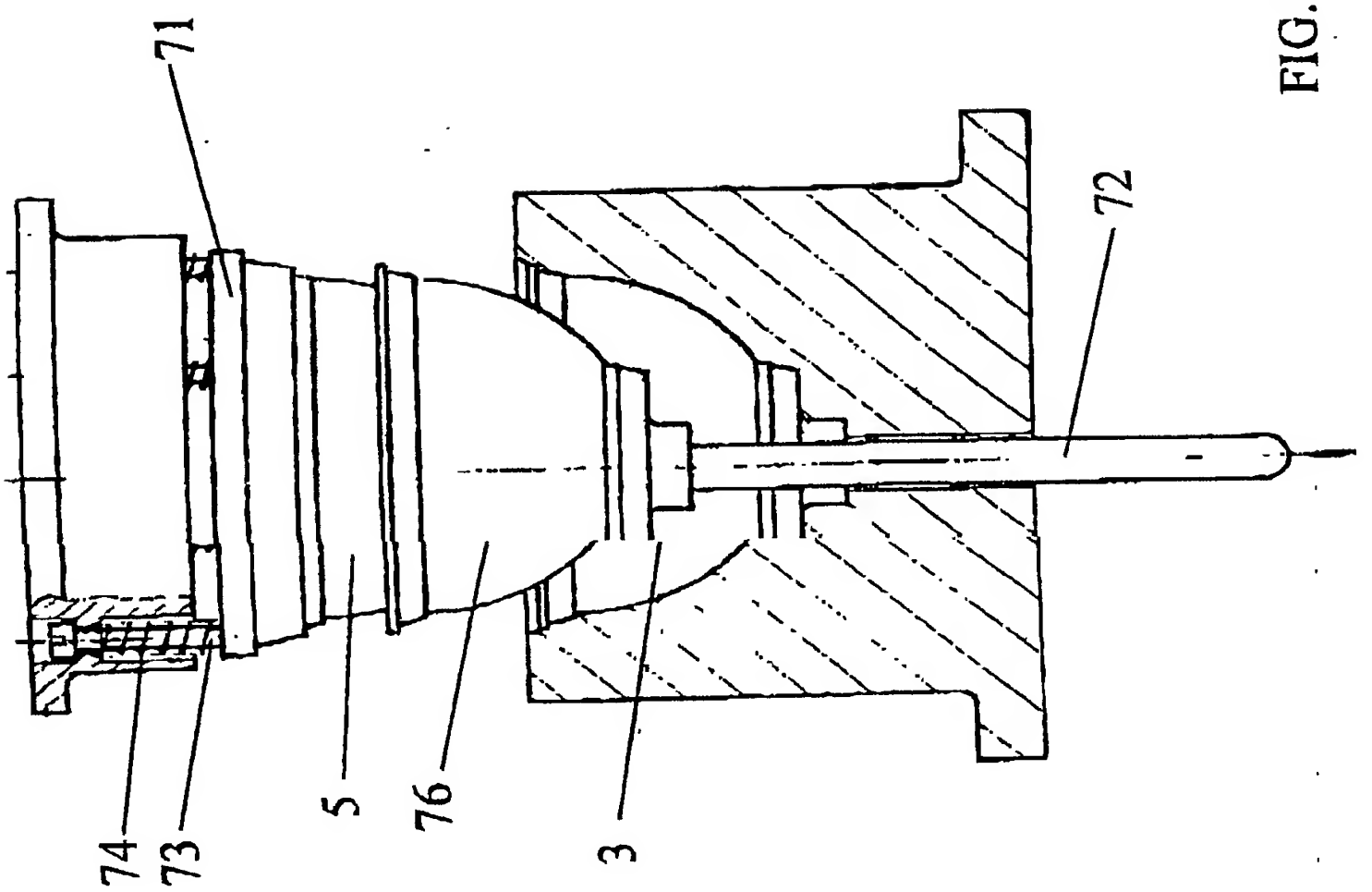

FIG. 8

DECLARATION AND POWER OF ATTORNEY U.S.A.

ALL PATENTS, INCLUDING DESIGN
FOR APPLICATION BASED ON PCT, PARIS CONVENTION, NON PRIORITY; OR PROVISIONAL APPLICATIONS

FOR ATTORNEYS' USE ONLY
ATTORNEYS' DOCKET NO

101 / 102

As a below named inventor, I declare that my residence, post office address and citizenship are stated below next to my name, the information given herein is true, that I believe that I am the original, first and sole inventor (if only one name is listed at 201 below), or an original, first and joint inventor (if plural inventors are named below at 201-203, or on additional sheets attached hereto) of the subject matter which is claimed and for which patent is sought on the invention entitled

"APPARATUS FOR MANUFACTURING BIODEGRADABLE PLANT FIBRE PRODUCTS"

which is described and claimed in
[ ] the attached specification
[X] PCT International Application No **PCT/CN99/00141** filed **7 September 1999**
[ ] the specification in application Serial No _____ filed _____
(if applicable) and amended on _____

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above
I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1 56
I hereby claim foreign priority benefits under Title 35, United States Code, §119 (a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed

103 / 104

Prior Foreign Application(s)

(Number)	(Country)	(Day/Month/Year Filed)	Priority Claimed Yes	No
			[ ]	[ ]
			[ ]	[ ]
			[ ]	[ ]

I hereby claim the benefit under Title 35, United States Code,§119(e) of any United States provisional application(s) listed below
Application No _____ Filing Date _____ Application No _____ Filing Date _____

105

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1 56 which became available between the filing date of the prior application and the national or PCT international filing date of this application

(Application Serial No)	(Filing Date)	(Status patented, pending, abandoned)

POWER OF ATTORNEY As a named inventor, I hereby appoint the following attorneys (Registration No) to prosecute this application, receive and act on instructions from my agent, and transact all business in the Patent and Trademark Office connected therewith HARVEY B JACOBSON, JR (20,851), D. DOUGLAS PRICE (24,514), JOHN CLARKE HOLMAN (22,769), MARVIN R. STERN (20,640); ALLEN S MELSER (27,215), MICHAEL R SLOBASKY (26,421), JONATHAN L SCHERER (29,851), IRWIN M AISENBERG (19,007), WILLIAM E. PLAYER (31,409), YOON S HAM (45,307) and NATHANIEL A HUMPHRIES (22,772)

SEND CORRESPONDENCE TO: **CUSTOMER NO. 00136**
or
JACOBSON HOLMAN
PROFESSIONAL LIMITED LIABILITY COMPANY
400 SEVENTH STREET, N.W.
WASHINGTON, D.C. 20004

DIRECT TELEPHONE CALLS TO
(please use Attorney's Docket No) (202) 638-6666

JACOBSON HOLMAN
PROFESSIONAL LIMITED LIABILITY COMPANY

*Inventor(s) name must include at least one unabbreviated first or middle name

201	FULL NAME OF INVENTOR*	FAMILY NAME: **ZHANG**	GIVEN NAME: **Wei**	MIDDLE NAME: **n.a.**	
	RESIDENCE & CITIZENSHIP	CITY: **Wuhan, Hebei**	STATE OR FOREIGN COUNTRY: **People's Republic of China**	COUNTRY OF CITIZENSHIP: **People's Republic of China**	
	POST OFFICE ADDRESS	POST OFFICE ADDRESS: **No. 89(-10-4) Tong Hun Road, Wucheng District**	CITY: **Wuhan, Hebei**	STATE OR COUNTRY: **People's Republic of China**	ZIP CODE: **n.a.**
202	FULL NAME OF INVENTOR*	FAMILY NAME	GIVEN NAME	MIDDLE NAME	
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP	
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE OR COUNTRY	ZIP CODE
203	FULL NAME OF INVENTOR*	FAMILY NAME	GIVEN NAME	MIDDLE NAME	
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP	
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE OR COUNTRY	ZIP CODE

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon

SIGNATURE OF INVENTOR 201*	SIGNATURE OF INVENTOR 202*	SIGNATURE OF INVENTOR 203*
DATE 2002.4.24	DATE	DATE

[ ] Additional inventors are named on separately numbered sheets attached hereto.

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